

The Influence of Artificial Intelligence Utilization in Learning on Education Students' Learning Independence

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ABSTRACT

This study investigates the influence of Artificial Intelligence (AI) utilization in learning on the learning independence of education students in higher education. The increasing integration of AI technologies in educational environments has created opportunities to support self-directed and self-regulated learning, although concerns regarding student dependency on AI remain significant. This study employed a quantitative approach using a survey method involving 120 education students selected through purposive sampling. Data were collected through Likert-scale questionnaires measuring AI utilization and learning independence. The collected data were analyzed using descriptive statistics, validity and reliability tests, and simple linear regression analysis. The findings revealed that AI utilization has a significant positive effect on students' learning independence, with a regression coefficient value of $\beta = 0.671$ and a significance level of 0.000. The results also showed that AI contributes 45% to the variance in learning independence. AI-supported learning environments help students improve self-regulation, learning initiative, metacognitive strategies, and independent problem-solving skills. However, excessive reliance on AI may reduce critical thinking and learner autonomy if not accompanied by proper guidance. Therefore, AI should be integrated as a learning support tool that encourages active, reflective, and autonomous learning in higher education.

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1. INTRODUCTION

Artificial Intelligence (AI) has become one of the most transformative technologies in higher education, influencing how students access information, interact with learning resources, and develop academic skills. The rapid growth of AI-based applications such as ChatGPT, intelligent tutoring systems, adaptive learning platforms, and educational chatbots has significantly changed the learning environment in universities. In the context of education students, the

integration of AI into learning activities offers opportunities to create more flexible, personalized, and interactive learning experiences. AI enables students to receive immediate feedback, explore knowledge independently, and access learning materials without limitations of time and place. These advantages are highly relevant to the demands of 21st-century education, which emphasize independent learning, critical thinking, and lifelong learning competencies. However, despite the increasing adoption of AI in education, concerns have emerged regarding students' dependence on AI-generated answers and the potential decline of autonomous learning behaviors. This phenomenon raises important questions about whether AI truly strengthens students' learning independence or instead weakens their initiative and critical engagement in the learning process.

The issue of learning independence has become increasingly important in higher education because university students are expected to become self-directed learners who are capable of regulating their own learning activities. Learning independence refers to students' ability to plan, monitor, evaluate, and take responsibility for their own learning processes. In educational faculties, learning independence is particularly crucial because education students are future teachers who are expected to model autonomous learning behaviors in their future classrooms. Nevertheless, several studies indicate that many students still rely heavily on lecturers, rigid learning instructions, and external academic support, resulting in low self-regulated learning and limited initiative in independent knowledge exploration. The emergence of AI technology creates both opportunities and challenges in this context. On one hand, AI-based learning systems can support students in setting learning goals, organizing learning strategies, and reflecting on learning outcomes. On the other hand, excessive reliance on AI tools may reduce students' autonomy and encourage passive acceptance of information. Therefore, understanding the relationship between AI utilization and learning independence has become an important issue in contemporary educational research.

Previous studies have shown that AI has substantial potential to support self-regulated learning (SRL) and self-directed learning (SDL). A systematic review conducted by Lan and Zhou explained that AI technologies such as chatbots, intelligent tutoring systems, analytics, and e-textbooks can assist students during planning, implementation, and reflection stages of learning by providing learning strategies, goal-setting support, and personalized feedback. However, the study also emphasized the risk of overreliance on AI systems, which may reduce students' autonomy if learning decisions are excessively controlled by technology (Lan & Zhou, 2025). Similarly, a systematic review by Younas et al. found that AI-based systems contribute positively to self-directed learning by offering personalized recommendations, immediate responses, and interactive learning experiences that strengthen students' sense of autonomy and competence (Younas et al., 2025). These findings suggest that AI can function as both a facilitator and a challenge to independent learning depending on how it is implemented within educational settings.

Empirical quantitative studies also demonstrate the positive relationship between AI utilization and learning independence. Research conducted by Wu et al. revealed that self-efficacy and learning motivation mediate the relationship between AI interaction quality and students' self-directed learning abilities in generative AI environments. The study showed that students who perceived strong instructional support and meaningful AI interaction tended to demonstrate higher self-directed learning behaviors (Wu et al., 2024). Furthermore, research by Zhai and Nezakatgoo found that AI applications such as ChatGPT and Poe significantly improved students' metacognitive strategies, autonomous motivation, and social learning strategies. Reflective journals from participants indicated that AI encouraged independent exploration and self-reflection, although some students tended to use AI superficially without engaging deeply in analytical thinking (Zhai & Nezakatgoo, 2025). Additional studies also indicate that students' perceptions of AI usability and educational value positively influence their learning autonomy and independent learning tendencies (Shah & Samo, 2026; Alqurni, 2026). These findings demonstrate that AI possesses strong potential to enhance independent learning when supported by positive learning attitudes and appropriate instructional guidance.

Despite these positive findings, researchers have also identified several negative implications of AI utilization for students' learning independence. Generative AI technologies may unintentionally encourage dependency behaviors when students rely excessively on instant answers rather than engaging in critical thinking and problem-solving activities. A study by Fan et al.

reported that while many students experienced increased creativity, learning efficiency, and independent initiative through AI usage, approximately 17% of participants admitted that their independent thinking abilities weakened because they tended to accept AI-generated answers without further analysis (Fan et al., 2025). Similarly, qualitative findings from Babayev (2025) indicated that AI personalization systems can improve motivation and learning planning but may also reduce students' initiative and autonomy if learners become overly dependent on AI recommendations. This concern is reinforced by the review conducted by Lan and Zhou (2025), which highlighted that excessive AI intervention in planning and reflective processes may decrease students' self-efficacy and agency over time. These findings indicate that the influence of AI on learning independence is not entirely positive and requires careful pedagogical consideration.

The dual nature of AI utilization in education demonstrates the importance of instructional design in determining whether AI strengthens or weakens students' autonomy. Research by Lee et al. showed that guided AI implementation can positively improve self-regulated learning and higher-order thinking skills. In their randomized controlled trial, students were required to attempt solving problems independently before receiving AI-based guidance or hints from ChatGPT. This instructional design successfully increased students' knowledge construction, reflective thinking, and learning autonomy compared to unrestricted AI use (Lee et al., 2024). These findings suggest that AI should not merely function as an answer-generating tool but rather as a scaffold that encourages students to engage actively in the learning process. Consequently, educators play a crucial role in designing AI-supported learning environments that balance technological assistance with students' independent cognitive engagement.

Although studies regarding AI in education have increased significantly, several important research gaps remain. Existing studies predominantly focus on academic achievement, learning effectiveness, engagement, and technology acceptance rather than learning independence as the primary variable (Msambwa et al., 2025; Crompton & Burke, 2023). Furthermore, empirical research specifically examining the direct influence of AI utilization on education students' learning independence remains limited, especially in developing countries such as Indonesia. Many studies are cross-sectional surveys with small sample sizes, making it difficult to understand the long-term impact of AI on students' agency, identity, and autonomous learning habits (Babayev, 2025; Younas et al., 2025). Cross-cultural and longitudinal investigations are also still underexplored in the context of AI-supported self-directed learning (Saad & Abdullah, 2025). Therefore, there is a clear need for further empirical studies that investigate how AI utilization affects students' learning independence in authentic higher education environments.

Based on these conditions, this study offers novelty by specifically examining the influence of Artificial Intelligence utilization on education students' learning independence within higher education contexts. Unlike previous studies that mainly focused on general academic performance or technology acceptance, this research emphasizes learning independence as the primary outcome variable. In addition, the study explores both the positive and negative dimensions of AI utilization, including its potential to support autonomous learning and its risk of creating dependency behaviors among students. This research is also relevant to the implementation of technology-enhanced learning in Indonesian higher education, where empirical evidence regarding AI and autonomous learning remains limited. Therefore, the main objective of this study is to analyze the influence of Artificial Intelligence utilization in learning on education students' learning independence and to identify how AI-supported learning environments contribute to the development of autonomous learning behaviors in higher education contexts.

2. LITERATURE REVIEW

Artificial Intelligence in Higher Education Learning

Artificial Intelligence (AI) has rapidly transformed higher education by introducing adaptive, interactive, and personalized learning systems that support students' academic development. AI technologies such as ChatGPT, intelligent tutoring systems, learning analytics, and adaptive platforms are increasingly integrated into university learning environments to improve access to information and facilitate independent learning activities. AI enables students to receive

immediate feedback, explore learning resources autonomously, and engage in flexible learning experiences without limitations of time and place. According to Lan and Zhou (2025), AI systems can support self-regulated learning processes through planning assistance, monitoring strategies, and reflective learning activities. Similarly, Younas et al. (2025) explained that AI-based learning environments enhance self-directed learning by providing personalized recommendations, fast responses, and interactive support that strengthen students' autonomy and competence in learning. These findings indicate that AI has become an important component in promoting student-centered learning in higher education. (Lan & Zhou, 2025; Younas et al., 2025).

Learning Independence in Higher Education

Learning independence is considered a fundamental competency in higher education because university students are expected to manage and regulate their own learning processes effectively. Independent learning refers to students' ability to set learning goals, organize learning strategies, monitor progress, evaluate outcomes, and take responsibility for their academic achievement. In the context of education students, learning independence is particularly important because future teachers are required to possess autonomous learning skills that can later be transferred into classroom practices. However, many students still demonstrate low levels of self-regulated learning due to dependence on lecturers, rigid instructional systems, and passive learning habits. Wu et al. (2024) found that self-efficacy and learning motivation significantly influence students' self-directed learning abilities within AI-supported learning environments. In addition, Shah and Samo (2026) reported that students' perceptions of AI usability and educational value positively contribute to learning autonomy and independent learning tendencies. Therefore, strengthening learning independence has become an important educational priority in modern higher education systems. (Wu et al., 2024; Shah & Samo, 2026).

The Role of AI in Supporting Self-Regulated and Self-Directed Learning

AI technologies have shown substantial potential in supporting self-regulated learning (SRL) and self-directed learning (SDL) among university students. Self-regulated learning involves planning, monitoring, controlling, and reflecting on learning activities, while self-directed learning emphasizes students' initiative and responsibility in managing their own learning processes. AI-based systems can facilitate these processes through adaptive feedback, personalized learning recommendations, and interactive learning guidance. Research conducted by Zhai and Nezakatgoo (2025) demonstrated that AI applications such as ChatGPT and Poe significantly improved students' metacognitive strategies, social learning strategies, and autonomous motivation. Furthermore, Alqurni (2026) found that AI-supported autonomy and self-efficacy positively influenced students' independent learning motivation and self-learning behaviors. These findings suggest that AI can serve as an educational scaffold that encourages students to become more reflective, proactive, and autonomous learners in higher education contexts. (Zhai & Nezakatgoo, 2025; Alqurni, 2026).

Positive and Negative Impacts of AI on Learning Independence

Although AI offers many educational benefits, its implementation also creates challenges related to students' learning independence. On the positive side, AI can increase learning efficiency, creativity, motivation, and access to academic resources. Students can independently explore information, receive personalized support, and improve their problem-solving abilities through AI-assisted learning systems. However, excessive dependence on AI-generated answers may weaken students' critical thinking and independent reasoning abilities. Fan et al. (2025) reported that while many students experienced increased learning initiative and creativity through AI usage, some participants admitted that their independent thinking abilities declined because they tended to accept AI responses without further evaluation. Similarly, Babayev (2025) explained that AI personalization systems may reduce students' autonomy and initiative if learners rely too heavily on technological recommendations. These findings indicate that AI possesses a dual impact on learning independence, functioning as both a facilitator and a potential source of dependency in higher education learning. (Fan et al., 2025; Babayev, 2025).

3. METHOD

This study employed a quantitative research approach with a correlational research design to analyze the influence of Artificial Intelligence (AI) utilization in learning on education students' learning independence in higher education. The study was conducted among undergraduate students from the Faculty of Education who actively utilized AI-based applications such as ChatGPT, intelligent tutoring systems, adaptive learning platforms, and educational chatbots during learning activities. The population consisted of education students from several universities, while the sample was selected using purposive sampling techniques based on specific criteria, namely students who had experience using AI in academic learning for at least one semester. Data collection was conducted using a structured questionnaire distributed online through Google Forms. The questionnaire consisted of two main variables, namely AI utilization and learning independence. The AI utilization instrument measured aspects such as frequency of AI usage, perceived usefulness, interactivity, accessibility, and learning support, while the learning independence instrument measured indicators including self-regulated learning, learning initiative, responsibility, self-confidence, and independent problem-solving abilities. All questionnaire items used a five-point Likert scale ranging from strongly disagree to strongly agree.

The collected data were analyzed using descriptive and inferential statistical techniques with the assistance of SPSS software. Descriptive statistics were used to identify the general profile of students' AI utilization and levels of learning independence, including mean scores, percentages, and standard deviations. Before hypothesis testing, the instruments were tested for validity and reliability using Pearson Product Moment correlation and Cronbach's Alpha coefficients to ensure the quality and consistency of the research instruments. Classical assumption tests, including normality and linearity tests, were also conducted prior to regression analysis. Furthermore, simple linear regression analysis was applied to determine the influence of AI utilization on students' learning independence. The level of significance in this study was set at 0.05. The findings of this analysis were expected to provide empirical evidence regarding whether the utilization of Artificial Intelligence contributes positively to strengthening education students' autonomous learning behaviors in higher education contexts.

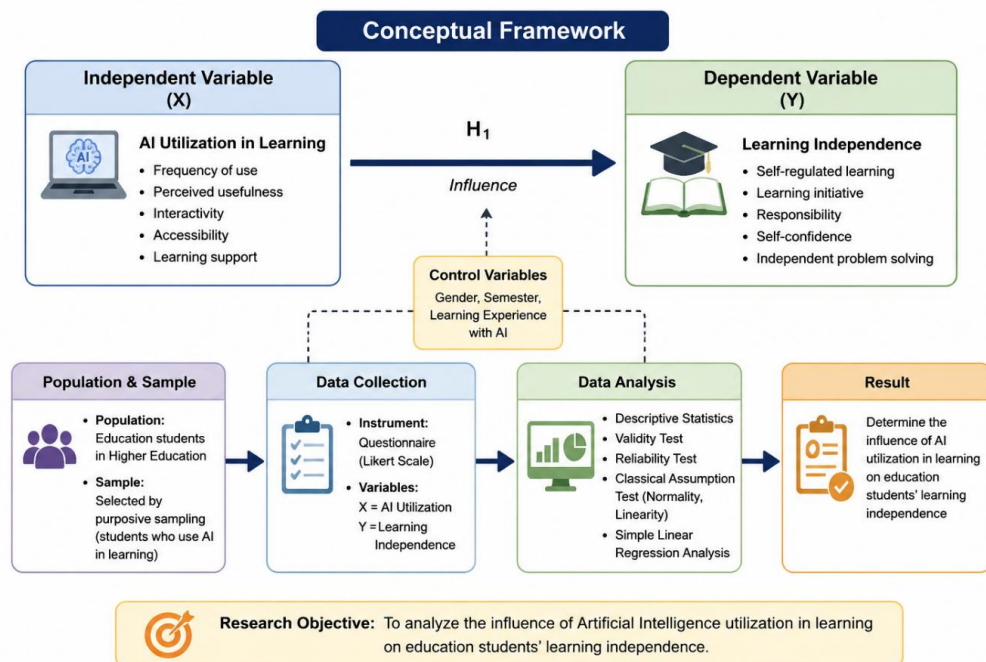


Figure 1. Diagram Conceptual Research

4. RESULTS AND DISCUSSION

The results of the study were obtained from questionnaires distributed to 120 education students who had used Artificial Intelligence (AI) applications in the learning process. The data analysis focused on the influence of AI utilization in learning on students' learning independence in higher education. The following table presents the results of the simple linear regression analysis.

Table 1. The Influence of Artificial Intelligence Utilization on Students' Learning Independence

Variable	Mean	Std. Deviation	Beta (β)	t-value	Sig.	Interpretation
AI Utilization in Learning	4.18	0.62	0.671	9.842	0.000	Significant Positive Effect
Learning Independence	4.05	0.58	–	–	–	High Category
R Square	–	–	0.450	–	–	45.0% Contribution
F-value	–	–	–	96.861	0.000	Regression Model Significant

Based on Table 1, the findings indicate that the utilization of Artificial Intelligence in learning has a significant positive influence on students' learning independence. The regression analysis shows a beta coefficient of 0.671 with a significance value of 0.000, which means that AI utilization contributes positively to improving students' autonomous learning behavior. The R Square value of 0.450 indicates that 45.0% of the variation in learning independence can be explained by AI utilization in learning, while the remaining percentage is influenced by other factors outside the study. Furthermore, the high mean scores on both variables demonstrate that students generally perceive AI as useful in supporting self-regulated learning, independent problem-solving, and learning initiative. These findings suggest that AI-based learning tools can strengthen students' ability to manage their own learning processes when used appropriately in higher education contexts.

Discussion

The findings presented in Table 1 demonstrate that the utilization of Artificial Intelligence (AI) in learning has a significant positive effect on students' learning independence, as indicated by the regression coefficient value ($\beta = 0.671$) and significance level ($p < 0.001$). The mean score of AI utilization (4.18) and learning independence (4.05) also indicates that education students generally perceive AI as an important learning support tool that encourages independent learning behavior. Furthermore, the R Square value of 0.450 reveals that 45% of the variation in students' learning independence can be explained by the use of AI in learning activities. These results confirm that AI technologies, such as intelligent tutoring systems, adaptive feedback platforms, and generative AI applications, are increasingly integrated into higher education learning environments and contribute substantially to the development of self-directed learning and self-regulated learning among students. This finding is consistent with previous studies which emphasize that AI has become a transformative educational tool capable of enhancing students' autonomy, metacognitive regulation, and independent learning strategies in higher education contexts (Achuthan, 2025; Lan & Zhou, 2025).

The significant influence of AI utilization on learning independence found in this study can be explained through the role of AI in supporting self-regulated learning (SRL). AI-based learning systems enable students to plan, monitor, and evaluate their own learning processes more effectively. Through instant feedback, personalized recommendations, and adaptive learning pathways, AI allows learners to become more active in managing their academic progress. The results of this study align with the meta-analysis conducted by Achuthan (2025), which reported a strong effect size of AI interventions on self-regulated learning ($g = 1.61$) and self-directed learning

($g = 1.11$), particularly in the planning and reflection phases. AI applications help learners establish goals, identify learning strategies, and evaluate learning outcomes independently. Consequently, students who actively use AI tools tend to demonstrate stronger initiative, responsibility, and confidence in completing academic tasks. Similarly, Lan and Zhou (2025) explained that AI-supported educational systems contribute positively to metacognitive development by helping learners organize learning activities systematically. Therefore, the current findings strengthen the argument that AI can function as a cognitive scaffold that enhances students' ability to regulate their own learning behavior.

In the context of higher education, particularly among education students, the role of AI as a facilitator of independent learning is highly relevant because university learning demands greater learner autonomy than secondary education. Education students are expected to become future teachers who possess the ability to learn independently, solve problems critically, and continuously develop professional competencies. The findings of this study indicate that AI utilization can support these expectations by encouraging students to access learning resources independently, explore information critically, and make learning decisions autonomously. This result is supported by Eşiyok et al. (2024), who found that students who frequently used AI learning tools demonstrated stronger self-directed learning practices and higher levels of self-regulation. Their study also highlighted that AI contributes to a shift from teacher-centered learning toward learner-centered environments, where students become more responsible for their learning process. Similarly, Tverdokhliebova and Yevtushenko (2025) reported that AI-mediated instruction significantly improved learning motivation, academic achievement, and independent learning strategies compared to traditional instruction. These studies indicate that AI can foster active participation and independent exploration, which are essential components of learning independence in higher education.

The present findings also reflect the importance of psychological factors in mediating the relationship between AI utilization and learning independence. Students who perceive AI as useful and supportive are more likely to develop a sense of competence and autonomy in learning. According to Self-Determination Theory, feelings of autonomy and competence are fundamental psychological needs that drive intrinsic motivation and independent learning behavior. Wang et al. (2025) argued that autonomy support in AI learning environments significantly influences metacognitive knowledge and motivational beliefs. When students feel that they have control over how they use AI technologies, they tend to become more engaged in self-regulated learning strategies. In this study, the high mean score for AI utilization suggests that students perceive AI not merely as a passive information provider, but as an active learning partner that supports their learning needs. This perception likely contributes to the positive impact on learning independence observed in the regression analysis.

Moreover, AI technologies can facilitate personalized learning experiences that accommodate students' individual learning needs, preferences, and abilities. Unlike conventional learning environments that often apply uniform teaching methods, AI systems can provide adaptive recommendations and customized feedback based on students' learning progress. This adaptive characteristic enables learners to identify their weaknesses and strengths independently, thereby promoting greater ownership of learning. Hsu et al. (2023) emphasized that adaptive AI systems improve academic performance and self-regulation by delivering immediate and personalized support that helps students maintain learning engagement. Likewise, Mncube et al. (2026) found that AI-based educational technologies positively influence students' learning autonomy by supporting independent planning, monitoring, and reflection activities. These findings are consistent with the present study, where students who used AI more intensively also demonstrated higher levels of learning independence.

Another important finding reflected in the data is that AI utilization contributes not only to cognitive regulation but also to motivational aspects of learning independence. Students who use AI applications frequently often experience increased confidence in completing academic tasks because AI provides rapid assistance and clarification during the learning process. This immediate support reduces learning anxiety and encourages students to explore learning materials more independently. Zhai and Nezakatgoo (2025) found that AI applications such as ChatGPT and Poe

significantly improved autonomous motivation, metacognitive strategies, and exploratory learning behaviors among university students. Their study revealed that students felt more confident engaging in independent learning activities because AI tools allowed them to receive guidance instantly without waiting for instructor feedback. This condition likely explains why the respondents in the current study demonstrated relatively high levels of self-confidence and independent problem-solving skills as part of learning independence.

However, despite the positive findings, the results of this study should also be interpreted critically because AI utilization may generate negative consequences when used excessively or without proper guidance. Several studies have warned that over-reliance on AI technologies can weaken independent thinking and reduce genuine learner autonomy. Lan and Zhou (2025) explained that AI systems that dominate planning, reflection, and problem-solving processes may gradually replace students' active cognitive engagement, thereby decreasing self-efficacy and agency. Similarly, Fan et al. (2025) reported that approximately 17% of engineering students in China experienced a decline in independent thinking ability due to excessive dependence on AI-generated answers. Students tended to accept AI responses immediately without engaging in deeper reflection or critical analysis. This concern is highly relevant to the present study because although AI utilization positively influences learning independence overall, excessive dependency may eventually undermine the very independence it aims to support.

The potential risk of passive learning behavior associated with AI use is also supported by Crompton and Burke (2023), who argued that students may become less engaged in critical thinking and problem-solving when AI provides instant solutions to academic tasks. AI-generated responses can create an illusion of understanding without requiring students to engage in deeper cognitive processing. Jin et al. (2023) similarly emphasized that unregulated AI use may encourage surface learning approaches, where students focus on obtaining quick answers rather than constructing conceptual understanding independently. Therefore, the positive relationship identified in this study should not be interpreted as evidence that all forms of AI utilization automatically enhance learning independence. Instead, the effectiveness of AI in promoting autonomy depends greatly on how the technology is integrated pedagogically and how students are guided to use it responsibly.

For education students specifically, the findings of this study carry important implications because these students will eventually become teachers who integrate AI into classroom instruction. As future educators, they must not only develop their own independent learning skills but also understand how to facilitate students' autonomy through technology-enhanced learning environments. The positive impact of AI on learning independence identified in this study suggests that teacher education institutions should incorporate AI literacy and self-regulated learning strategies into their curricula. Students need guidance on how to use AI ethically, critically, and productively so that AI functions as a learning support system rather than a substitute for thinking. Mncube et al. (2026) emphasized that AI is most beneficial when positioned as a scaffold that supports reflection, monitoring, and independent inquiry rather than merely providing direct answers. Likewise, Wang et al. (2025) stressed the importance of designing AI learning environments that nurture autonomy and competence to encourage meaningful self-regulated learning behaviors.

Furthermore, the relatively high explanatory power of AI utilization in this study (45%) indicates that AI is becoming an influential factor in shaping learning behavior in higher education. Nevertheless, more than half of the variance in learning independence remains unexplained, suggesting that other variables such as motivation, digital literacy, learning environment, teaching quality, and socioeconomic background may also contribute significantly. Future studies should therefore investigate additional mediating and moderating factors that influence the relationship between AI utilization and learning independence. Longitudinal studies are also needed to examine whether the positive effects of AI on learning independence can be sustained over time or whether prolonged exposure eventually increases dependency risks. Such investigations are essential because current research on AI and learning autonomy remains dominated by cross-sectional designs and short-term interventions (Lan & Zhou, 2025; Younas et al., 2025).

Overall, the findings of this study confirm that the utilization of Artificial Intelligence in higher education positively influences students' learning independence. AI technologies support self-directed learning, self-regulated learning, metacognitive development, and autonomous motivation by enabling students to manage learning activities more independently. However, the benefits of AI must be balanced with appropriate pedagogical guidance to prevent over-reliance and passive learning behaviors. AI should therefore be positioned as a supportive learning scaffold that encourages active engagement, critical thinking, and reflective learning rather than merely functioning as an instant answer provider. These findings reinforce the importance of integrating AI literacy, ethical awareness, and self-regulated learning strategies into higher education curricula, particularly in teacher education programs, to ensure that AI contributes constructively to the development of independent and lifelong learners.

5. CONCLUSION

In conclusion, this study demonstrates that the utilization of Artificial Intelligence (AI) in learning has a significant positive influence on the learning independence of education students in higher education. The findings indicate that AI supports the development of self-directed learning, self-regulated learning, learning initiative, and independent problem-solving through adaptive feedback, personalized learning support, and flexible access to information. Students who actively utilize AI technologies tend to show higher levels of autonomy, responsibility, and confidence in managing their learning activities. However, the study also highlights that the effectiveness of AI in fostering learning independence depends on how the technology is used. Excessive dependence on AI may reduce critical thinking and learner autonomy if students rely solely on instant AI-generated answers. Therefore, AI should be positioned as a supportive learning scaffold that encourages reflection, exploration, and active engagement rather than replacing students' independent thinking processes. Overall, the study confirms that the proper integration of AI in higher education learning environments can strengthen students' learning independence and support the development of autonomous lifelong learners.

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